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Years: 1981-2003
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[no drawing available]

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Jointing device
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Int'l Class: E04B00158;

Patents Cited:
- GB0445476 A

Patents Citing This One (2):
- US5590504A1 19970107 Signfix Limited
  Mounting devices
- GB2281085A 19950222 Alusuisse-Lonza Services Ltd(CH)
  Structure for use in building modules

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Detailed Description

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SPECIFICATION

Jointing device 5This invention relates to a jointing device, a joint assembly incorporating said device and a method of forming the latterwhich is particularly applicable to the construction of prefabricated environmentally controlled rooms or buildings.

Rooms or buildings wherein the environment can be precisely controlled with regard to parameters such.as temperature, humidity or air purity are nowadays required in many spheres of human 75 activity. For example, such rooms or buildings may be required as operating theatres or sites of drug orfood

manufacture wherein one or all of the abovemen tioned parameters may need to be controlled. In most casesthe purity of the air in such rooms or buildings is of paramount importancewith regard to bacterial and othertypes of contamination. As it is virtually impossi bleto adequately seal orcontrol all points of air and entry in existing rooms or buildings and thereby maintain a sterile zone therein, it is usual to construct a 85 new **prefabricated room (^)** or building in instances where precise environmental control is required.

Hitherto, in the construction of a **prefabricated room (^)** or building forone of the aforementioned purposes, thefirststep has been the erection of a structural frame of vertical columns, horizontal cross beams and roof members in accordance with the desired final configuration of the room or building. Such a frame includes a large number of interconnections of the various parts byway of known angled brackets and bolts. Thereafter metal panels forforming the walls and roof of the building are bolted to theframe members and to each other in known manner.

Naturally, each such building must be constructed so asto meet pre-set standards of strength and also of 100 accuracy of thejoints. Indeed, thejoints should ideally be airtight so that subsequent environmental control of the interior may be satisfactorily achieved. If heavy apparatus is intended to be suspended from the ceiling or roof of the completed building, as, for 105 example, may often be the case in operating theatres where overhead lights and ventilation ducts are usual, additional structural members should be provided in the roof frameto permit a weight of about3/4tonne to be safely borne.

The above-described method of construction is, as may be expected, extremely costly in terms of materials and also time-consuming and troublesome forthe operatives because of the large number of differenttypes of interconnections which have to be made. Moreover, problems frequently arisewhen fittingthe sheetsteel panels6the structural steel frame asthe manufacturing tolerances normally specified within the two differenttypes of engineering production are incompatable. In the worst possible situation this might result in inaccurate joints which reducethe strength of the structure and the accuracy of eventual environmental control of the building interior. If the structural steel components were GB 2 128 215 A 1 manufacturedto a higher degree of accuracy,their costwould be prohibitive.

An object of the present invention isto eliminatethe structural steel frame, reducethe cost and significantly increase the strength of the aforementioned type of prefabricated structure by providing a simple jointinq device with which an accurate close-fitting joint may quickly and easily be formed.

With this object in view, the present invention provides a jointing device comprising a first profile stripformed generally as a channel section with first and second opposing webs connected by a base and having a lateral extension atthe free end of thefirst web, and a second profile strip of similar configuration, the lateral extension of the first profile stripfirmly abutting the base of the second profile strip so asto provide a gap between the base of thefirst profile strip and the lateral extension of the second profile strip sufficientto receive and secure abutting flanges of adjoining structural members.

Advantageously, the lateral extension of each profile strip is perpendiculartothefirstweb of the channel section andthe resultant gap between the base of thefirst strip and the lateral extension of the second strip is parallel-sided.

The firstweb of thefirst profile strip necessarily facesthe firstweb of the second profile strip and conveniently, a slight gap remains therebetween, for example, to permitfine adjustment during assembly of the device or introduction of a building sealant.

Preferably at least one of the profile strips isformed with a flange atthe end of the lateral extension.

Each profile strip may conveniently be formed with a shallow inwardly projecting rim along each edge.

In some circumstances, at least one rim of at least one strip may have an outwardly projecting lip for interfitment with another structural member.

Afurther aspect of the present invention is a joint assembly comprising a first profile strip formed generally as a channel section with first and second opposing webs connected by a base and having a lateral extension from the end of thefirst web, a second profile strip of similar conf igu ration, the lateral extension of the first profile strip firmly abutting the base of the second profile strip so as to provide a gap between the base of the first prof ile strip and the lateral extension of the second profile strip, and two structural members having abutting flanges which project into and are secured together in said gap.

Preferably, the heights of the flanges of thestructural members are less than the length of the gap between the profile strips.

The second web of the first profile strip advantageously abuts andlor is secu red to a region of one of the structural members adjacent its flange.

The lateral extension of the second profile strip is advantageously provided with a flange which may abut andlor be secured to a region of the other structural member adjacent its flange.

The flange of the second profile strip is advantageously disposed in the same plane as the second web of the first profile strip whenever the two The drawing(s) originally filed was/were informal and the print here reproduced is taken from a later filed formal copy.

2 structural members are disposed in the same plane as each other.

Anotheraspectof the invention is a method of forming the aforesaid joint assembly comprising the steps of forming a respective flange at edges of two structural membersto bejoined together; providing from mild steel panels 10 connected together by jointing devices according to the present invention. As indicated by the sectional lines 2-2,3-3,4-4,5-5, a number of different jointing devices are required to provide forsituations where the panels 10 adjoin one another at different angles or where additional structural members need to be mounted. For example, adjoining roof top panels 13 are co-planar and adjoining wall panels 11 are usually co-planar, whereas wall panels 11 adjoin roof side panels 12 at a pre-set obtuse angle, and roof side panels 12 adjoin roof top panels 13 at a different pre-set angle. Wall corner panels 14 and roof side corner panels 15 are also necessary in the structure and may meet adjacent panels atyet different angles.

Afirst practical embodiment of thejointing device of the invention is illustrated in Fig. 2 as part of a joint assemblywherein two wall panels 11 are secured together. This jointing device comprises first and second profile strips 20,30 of similar configuration and fitted together so asto provide a gap 16for reception and securement of abutting f langes 17,18 of adjacent structural members in theform of the wall panels 11.

As shown,the first profile strip 20 is formed generally as a channel section with first and second opposing parallel webs 21 and 22 of substantially equal length connected by a base 23 and having a lateral extension 24 atthe free end of thefirstweb 21. The lateral extension 24 has a flange 25 which is arranged parallel to the webs 21 and 22. The lateral extension 24 itself is parallel and of similar length to the base 23 and perpendicularto the webs 21, 22 and the flange 25. The edges of the profile strip 20, i.e. the free edges of the second web 22 and theflange 25 are each provided with a shallow inwardly

projecting rim 26,27 respectively. The second profile strip 30 is of similar configuration being formed generally as a channel section with opposing parallel first and second webs 31,32 connected by a base 33, a lateral extension 34with a flange 35 projecting from the first web 31 such thatthe lateral extension 34 is parallel with the base 33 and theflange 35 is perpendicular thereto. Again, the second web 32 and the flange 35 have respective shallow rims 36,37. However, the second prof ile strip 30 differs f rom the f irst strip 20 in that its second web 32 is shorterthan its firstweb 31. Moreover, the flange 35 of the second profile strip 30 is longerthan the corresponding flange 25 of the first profile strip 20. The first and second prof ile strips 20, 30 areformed of mild steel and are cut or formed to a length equal to the height of the wall panels 11. These strips 20,30 are fitted together "backto bacV such thatthe lateral extension 24 of the f irst profile strip 20 firmly abuts the base 33 of the second strip 30 so as to provide a gap 16 sufficieritto receive and secure abutting flanges 17,18 of adjoining wall panels 11. A gap 50 of approximately 1.Omm is provided between thefirstweb21 of thefirst profile strip 20 and the first GB 2 128 215 A 2 web31 ofthe second profile strip 30 This isto enable finite adjustment,if required, inthe direction of the arrows51,to achieve a perfectly fJat surface acrossthe faces oftheadjoining structural panels. 1 1.Alterna- tively or additionally, a building sealantmay be introduced intothegap 50. firstandsecond profilestrips eachformed generally as a channel section with first and second opposing webs connected by a base and having a lateral extension atthefree end of thefirst web; securing the base of thefirst profile stripto the inner side of the flange of the one structural member; securing the lateral extension of the second profile strip to the inner side of the flange of the other structural member; interfittingthetwo profile strips such that the lateral extension of the first strip firmly abuts the base of the second profile strip and the flanges of the two structural members also firmly abut each other; and securingthe resultant assembly, for example by means of bolts.

Since it is possible to produce profile strips of the above-described configurations with very accurate dimensions and the flanges on the structural members may also be accurately formed, the resultant assembly is close-fitting and substantially airtight. Moreover, byvirtue of the specifically chosen configurations of the profile strips, it has been proven by stress calculations that these joints are particularly strong and rigid.

The profile strips may be produced relatively inexpensively and the interconnection of the strips and the structural members to form the joints is a quickand easy operation compared to previous methods of assembly of prefabricated parts. Accor- dingly a structureformed by using the proposed jointing device and method of joint assembly would be considerably less expensive to erectthan a similar structure using known jointing devices and assembly methods.

The invention will be described further, byway of example, with referenceto the accompanying drawings, in which:

Fig. 1 is a diagrammatic perspective view of an entire prefabricated building incorporating various embodiments of thejointing device and joint assembly of the present invention; Fig. 2 is a fragmentary perspective view, generally viewed along the line in the direction of the arrows along the line 2-2 of Fig. 1, of a first practical embodiment of the joint assembly of the invention incorporating a first embodiment of the jointing device of the invention; Fig. 3 is a fragmentary perspective view, generally viewed in the direction of the arrows along either of the lines 3-3 of Fig. 1, illustrating a second practical embodiment of thejoint assembly of the invention, incorporating a second embodiment of thejointing device of the invention, and additional structural members which may be attached to the assembly; Fig. 4 is a partial cross-section along the line 4-4 of Fig. 1 of a third practical embodiment of thejoint assembly of the invention incorporating a third embodiment of the jointing device of the invention; and Fig. 5 is a partial cross-section along either of the 3 lines 5-5 of Fig. 1 illustrating a fourth partial em bodiment of the joint assembly of the invention, incorporating a fourth embodiment of the jointing device, attached to a further structural member.

Fig. 1 illustrates a prefabricated building, for example an operating theatre, which is constructed entirely from mild steel panels 10 connected together byjointing devices according to the present invention. As indicated bythe sectional lines 2-2,3-3,4-4, 5-5,a number of different joi nting devices are required to provide for situations where the panels 10 adjoin one another atclifferent angles orwhere additional structural members need to be mounted. For example, adjoining roof top panels 13 are co-planar and adjoining wall panels 11 are usually co-planar, whereas wall panels 11 adjoin roof side panels 12 at a pre-set obtuse angle, and roof side panels 12 adjoin roof top panels 13 at a different pre-set angle. Wall corner panels 14 and roof side corner panels 15 are also necessary in the structure and may meetadjacent panels atyet different angles.

Afirst practical embodiment of the jointing device of the invention is illustrated in Fig. 2 as part of a joint assemblywherein two wall panels 11 are secured together. Thisjointing device comprises first and second profile strips 20,30 of similar configuration and fitted together so as to provide a gap 16for reception and securement of abutting flanges 17,18 of adjacent structural members in theform of the wall panels 11.

As shown, the first profile strip 20 is formed generally as a channel section with first and second opposing parallel webs 21 and 22 of substantially equal length connected by a base 23 and having a lateral extension 24 atthefree end of thefirstweb 21. The lateral extension 24 has a flange 25 which is arranged parallel to the webs 21 and 22. The lateral extension 24 itself is parallel and of similar length to the base 23 and perpendicularto the webs 21,22 and the flange 25. The edges of the profile strip 20, i.e. the free edges of the second web 22 and the flange 25 are each provided with a shallow inwardly projecting rim 26,27 respectively. The second profile strip 30 is of similar configuration being formed generally as a channel section with opposing parallel first and second webs 31,32 connected by a base 13, a lateral extension 34with a flange 35 projecting from the first web 31 such thatthe lateral extension 34 is parallel with the base 33 and the flange 35 is perpendicular thereto, Again, the second web 32 and the flange 35 have respective shallow rims 36,37. However, the second profile strip 30 differsfrom the first strip 20 in that its second web 32 is shorterthan its first web 31. Moreover,the flange 35 of the second profile strip 30 is longerthan the corresponding flange 25 of the first profile strip 20. The first and second profile strips 20, 30 are formed of mild steel and are cut orformed to a length equal to the height of the wall panels 11. These strips 20,30 arefitted together "backto bacC such thatthe lateral extension 24 of the first profile strip 20 firmly abuts the base 33 of the second strip 30 so as to provide a gap 16 sufficientto receive and secure abutting flanges 17,18 of adjoining wall panels 11. A gap 50 of approximately 1.Omm is provided between thefirstweb21 of the first profile strip 20 and the first GB 2 128 215 A 3 web 31 ofthe second profile strip 30. This isto enable finite adjustment, if required, in the direction of the arrows 51,to achieve a perfectly flat su rface across thefaces ofthe adjoining structural panels 11.

Alternatively or additionally, a building sealant may be introduced into the gap 50.

In the aforesaid position, the respective second webs 22,32 of the first and second strips 20,30 are co-planarwith the respective flanges 35,25 of the second and first strips 30, 20.

The mild steel wall panels 11 should b provided with appropriate flanges of substantially equal height along each edge which is intended to adjoin another panel 10. In this case, perpendicular flanges 17,18 are provided. In orderto secure the two wall panels 11 together and form a joint assembly as illustrated in Fig. 2 it is envisaged thatthe base 23 and the second web 22 of the first profile strip are spotwelded, as at 19, to the inner side of the flange 17 and the region of the one panel 11 adjacent thereto. Similarly,the lateral extension 34 andtheflange35 of the second profile strip 30 arespotwelded to the innerside of theflange 18 and the region of the other panel 11 adjacent thereto. Itwill be appreciated thatas long asthe profile strips 20,30 and the panels 11 were accurately machined during production, so as to have smooth

level surfaces and right angle bends, the aforesaid connections will be extremely close-fitting. Thetwo profile strips 20,30 are subsequently interengaged as previously described, and as illustrated in Fig. 2, to form a jointing device with the panel flanges 17,18 abutting each other, as shown, within the gap 16 between the base 23 of thefirst strip 20 and the lateral extension 34 of the second strip 30. The entire assembly isfirmly secured in this configuration by bolts 29 to form a particularly strong and close-fitting joint.

Fig. 3 illustrates a second embodiment of the jointing device of the invention as may be used to secure two roof top panels 13 together. The device and the method of forming the point assembly are virtually identical to what has just been described and the same reference numerals are used for corresponding parts. In this embodiment however, the rim 27 of the first profile strip 20 and the rim 36 of the second profile strip 30 are provided with respective perpendicular outwardly projecting lips 28,38, which lie in the same place as each other in the assembled joint. Additional structural members such as outer roof panels 39, as illustrated, maybe seated or supported upon said lips 28,38.

Athird embodiment of the jointing device of the invention is illustrated in Fig. 4.As indicated in Fig. 1, this may be used forformation of a joint between a wall panel 11 and a roof side panel 12. The same reference numerals have again been used for parts corresponding to parts illustrated in Fig. 2. This embodiment of the jointing device of the invention differs from the embodiment illustrated in Fig. 2 in that the second web 22 of the first profile 20 is considerably longerthan the first web 21 thereof and the edge rim 26 extends at an acute angle to said second web 22. More importantly, however, this embodiment includes a third angled profile strip 40 one limb 41 of which is equal in length to and abuts the aforesaid 4 second web 22. The strip 40 also has inwardly projecting edge rims 43.

The method of forming a joint assembly incorporating this device is generally similarto that described in relation to the embodiment of Fig. 2. The third profile strip 40 is required to interfit between the second web 22 and the region of the sloping roof side panel 12 adjacent itsfiange 17 so asto provide a rigid joint. During assembly,the limb 41 of the third strip 40 shouldfirstly be welded to thefirst strip 20 and the resultant unit subsequently welded to the roof side panel 12 such thatthe base 23 of the first strip 20 adjoins theflange 17 which is arranged at an obtuse angleto the main body of the panel 12, and the second limb 42 of the strip 40 adjoins a region of the panel 12 adjacent said flange 17. Thefirst and second strips 20, 30 arethen interengaged and bolted together as previously described so asto secure the panel flanges 17,18together in substantially air-tight manner.

Finally, a fourth embodiment of thejointing device of the invention is illustrated in Fig. 5. This embodiment may be used to provide a joint between a roof side panel 12 and a roof top panel 13 or a roof side corner panel 15. Compared to the device of Fig. 2, the second web 22 of thefirst profile strip 20 extends outwardlyfrom the base 23 at an obtuse angle so as to be ableto abutthe sloping panel 12 and the second web 32 of the second profile strip 30 is substantially equal in length to the firstweb 31 thereof. Moreover, a third profile strip 45 having a lazy-Z-shaped crosssection is welded to the second web 32 of the second profile strip 30 in orderto provide a lip 46 extending outwardlyfrom and substantially perpendicularto the rim 36 in the same manner as the integral lips 28,38 shown in Fig. 3. Afurther structural member 49, such as an outer roof panel may be secured to the lip 46, e.g. by means of bolts, as indicated in Fig. 5.

The invention is not limited to the precise details of theforegoing embodiments and many variations are possible depending on the angles at which adjacent panels are intended to meet. ftwill, of course, be understood thatthe locations referred to for particular embodiments of the jointing device are merelythose in the example illustrated in Fig. 1. Also the profile strips and the structural panels may be formed of a different material to mild steel, e.g. aluminium or anothersuitable metal or alloy.

Calculations have indicated thatjointing devices having the configurations now proposed are capable 50. of withstanding considerable stress such that a structureformed entirely of flanged panels connected bysuch jointing devices does not require any internal supporting framework and can accommodate various types of roof loading of at least four times that of presentsystems without requiring additional strengthening.

As previously mentioned, such joints are particularly advantageousfor structures intended to be environmental ly-control led, e.g. dust-free, sterile, or of con- starittemperature or humidity, becausethe precision which may be readily attained in the production of flanged panels and profile strips permits these membersto fittogetherwith great accuracy and form substantially air- tightjoints.

Claims (English)

CLAIMS

GB 2 128 215 A 4 1. Ajointing device comprising a first profile strip formed generally as a channel section with first and second opposing webs connected by a base and having a lateral extension atthefree end of the first web, and a second profile strip of similar configuration,the lateral extension of thefirst profile stripfirmly abutting the base of thesecond profilestrip so asto provide a gap between the base of thefirst profilestrip and the lateral extension of thesecond proffiestrip sufficientto receive and secure abutting flangesof adjoining structural members.

2. A device as claimed in claim 1 wherein the lateral extension of each profile strip is perpendicular to the firstweb of the channel section and the resultant gap between the base of the first strip and the lateral extension of the second strip is pa rail el-sided.

3. Adevice as claimed in claim 1 or2wherein a slight gap remains between the first web of the first profile strip and the firstweb of the second profile strip (which necessarily face one another) to permit fine adjustment during assembly of the device or introduction of a building sealant.

4. Adevice as claimed in claim 1, 2 or3wherein at least one of the profile strips is formed with a flange at the end of the lateral extension.

5. A device as claimed in any preceding claim wherein each profile strip is formed with a shallow inwardly projecting rim along each edge.

6. A device as claimed in any preceding claim wherein at least one rim of at least one strip has an outwardly projecting 1 i p for interfitment with another structural member.

7. Ajoint assembly comprising a first profile strip formed generally as a channel section with first and second opposing webs connected by a base and having a lateral extension from the end of the first web, a second profile strip of similar configuration, the lateral extension of the first profile strip firmly abutting the base of the second profile strip so asto provide a gap between the base of the first profile strip and the lateral extension of the second profile strip, and two structural members having abutting flanges which project into and are secured together in said gap.

8. Ajoint assembly as claimed in claim 7 wherein the heights of the flanges of the structural members are less than the length of the gap between the profile strips.

9. Ajoint assembly as claimed in claim 8 wherein the second web of the first profile strip abuts andlor is

secured to a region of one of the structural members adjacent its flange.

10. Ajoint assembly as claimed in claim 8 or 9 wherein the lateral extension of the second profile strip is provided with a flangewhich abuts andlor is secured to a region of the other structural member adjacent its flange.

11. Ajoint assembly as claimed in claim 9 and 10 wherein the flange of the second profile strip is disposed in the same plane as the second web of the first profile strip and the two structural members are disposed in the same plane as each other.

12. A method of forming the joint assembly claimed in any of claims 7 to 11 comprising the steps of forming a respective flange at edges of two I structural members to be joined together; providing first and second profile strips each formed generally as a channel section with first and second opposing webs connected by a base and having a lateral extension atthefree end of thefirstweb; securing the base of thefirst profile striptothe innerside of the flange of the one structural member; securing the lateral extension of the second profile stripto the inner side of theflange of the otherstructural member; interfitting thetwo profile stripssuch thatthe lateral extension of the first strip firmly abutsthe base of the second profile strip andtheflanges of thetwo structural members alsofirmly abuteach other; and securingthe resultant assembly.

13. Ajointing device substantially as hereinbefore described with referenceto and as illustrated in Fig. 2, or Fig. 3, or Fig. 4, or Fig. 5 of the accompanying drawings.

14. Ajoint assembly substantially as hereinbefore described with reference to and as illustrated in Fig. 2, or Fig. 3, or Fig. 4, or Fig. 5 of the accompanying drawings.

15. A method of forming a joint assembly substantial ly as herein before described.

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